



19CH201 - ENGINEERING CHEMISTRY FOR CIRCUIT BRANCHES

UNIT-2 - ENERGY STORAGE DEVICES

2.6. Modern batteries

A battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy.

Zinc Air Batteries

Characteristics

An example of Metal Air batteries, cells using zinc-air technology are energized only when atmospheric oxygen is absorbed into the electrolyte through a gas-permeable, liquid-tight membrane. With the removal of a sealing tab, oxygen from the air is introduced into the cell. A zinc-air battery usually reaches full operating voltage within 5 seconds of being unsealed.

The zinc air cell is basically a primary battery however rechargeable designs for high power applications are possible by physically replacing the zinc electrodes.

They use the oxygen content of the air as active mass. The positive electrode (cathode) is a porous body made of carbon with air access. Atmospheric oxygen is reduced at this electrode. The active mass is thus not



contained in the electrode but is taken from the surrounding air as it is needed. The initial weight of the battery is reduced accordingly. The negative electrode (anode) consists of zinc.

An aqueous solution of potassium hydroxide serves as the electrolyte. The cell voltage for the chemistry is theoretically capable 1.65 Volts however almost all designs are optimised for less than 1.4 or 1.3 Volts in order to achieve longer lifetimes.

Advantages

- High energy density but low power
- Inexpensive materials
- The zinc-air system, when sealed, has excellent shelf life, with a self-discharge rate of only 2 percent per year.
- In relation to their physical size, Zinc/Air batteries store more energy per unit of weight (in terms of 220 Wh/kg) than almost any other primary type.
- Primary cells available in a range of button and coin cell sizes.
- Rechargeable high power cells available for traction applications.



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